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(b) an aesthetic composite or porcelain layer on the substructure.

54. (New) A method for making a dental prosthesis comprising the steps of:

- (a) providing a crystalline ceramic substructure having a Contrast Ratio value of less than about 0.7; and
- (b) providing an aesthetic composite or porcelain layer on the substructure.

55. (New) The method of claim 20 further comprising the step of (c) providing an aesthetic composite or porcelain layer on the mill blank.

A marked-up version of the amended claims is attached hereto as Exhibit B and in which underlined text should be added to the claims and text appearing within square brackets should be deleted from the claims.

No fee is believed to be required in conjunction with these amendments. However, any deficiency in fees should be charged to Deposit Account No. 13-3723.

REMARKS

A. NEW AND AMENDED CLAIMS

Applicants have added new independent claim 53 which describes a dental prosthesis comprising:

- (a) a crystalline ceramic substructure having a Contrast Ratio value of less than about 0.7; and
- (b) an aesthetic composite or porcelain layer on the substructure.

Applicants have also added new independent claim 54 which describes a method for making a dental prosthesis comprising:

- (a) providing a crystalline ceramic substructure having a Contrast Ratio value of less than about 0.7; and
- (b) providing an aesthetic composite or porcelain layer on the substructure.

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New claims 53 and 54 have been added to protect certain important embodiments of the invention, and are supported by original claim 40 (as renumbered) as well as the originally filed specification at, for example, page 12, lines 3-15.

Claims 6-10, 12, 13, 15, and 41-50 have been amended to depend from new independent claim 53 and to incorporate other conforming changes.

Independent claim 20 has been amended to incorporate the subject matter of claim 26 therein and claim 26 has been cancelled. New claim 55 has been added and specifies that the method of claim 20 further comprises the step of providing an aesthetic composite or porcelain layer on the mill blank. Claim 55 is supported by the same citations as provided for new claims 53 and 54.

As a result, the following claims are currently pending in the application:

1. Independent claim 20 directed to a method for making a dental prosthesis, and its dependent claims 21-25, 27-32 and 55; and
2. Independent claim 53 directed to a dental prosthesis and its dependent claims 6-10, 12, 13, 15 and 41-50; and
3. Independent claim 54.

B. SUMMARY OF THE EXAMINER'S REJECTIONS

The Examiner rejected claims 1-19, 36 and 49 under 35 U.S.C. §102(a) as being anticipated by various materials disclosed in Applicants' specification and identified by the Examiner as CTTPA, GEL, VMT9A, ZrO₂, AIX and NORTON.

The Examiner rejected claims 1, 3-7, 9-19 and 37 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 3,026,210 to Coble. Claims 1, 3-6, 8-19 and 37 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 4,174,973 to Rhodes et al. Claims 1, 2, 4-25, 29-31, 33-41, 43-48 and 51 were rejected by the Examiner under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 4,639,218 to Jones et al. Claims 1, 3-7, 9-25, 29-40 and 42-51 were rejected by the Examiner under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,217,375 to Oden et al.

Claims 26-28, 30-32 and 36-39 were rejected under 35 U.S.C. §103(a) as being unpatentable over Oden et al.

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The Examiner rejected claims 12, 13, 24 and 25 under 35 U.S.C. §112, first paragraph, because, according to the Examiner, the specification does not reasonably provide enablement for blank materials having flexural strengths greater than 350 mPa.

These rejections are respectfully traversed.

C. INDEPENDENT CLAIM 20 AND ITS DEPENDENT CLAIMS

Independent claim 20 has been amended to incorporate the subject matter of claim 26. Accordingly, claim 20 is now directed to a method for making a dental prosthesis wherein the method comprises the steps of:

- a) providing a dental mill blank comprising crystalline ceramic having a Contrast Ratio value less than about 0.7; and
- b) carving the mill blank into a desired shape in less than about 3 hours.

The Examiner's rejections under 35 U.S.C. §102(a)/(b) relying upon the various materials disclosed in Applicants' specification, and the Coble, Rhodes et al., Jones et al., and Oden et al. references did not extend to claim 26. Accordingly, claim 20, which has been amended to include the subject matter of claim 26, is patentable over these rejections and further discussion of the cited references in this regard is unnecessary.

The Examiner rejected claim 26 as being obvious under 35 U.S.C. §103(a) in view of Oden et al. However, Oden et al. would not be expected to provide a dental mill blank comprising crystalline ceramic having a Contrast Ratio value less than about 0.7. The sole working example in Oden et al. describes sintering a core in air for 2 hours at 1600°C. The resulting core had a relative density of 99.5% and a minimum thickness of 1 mm. (See column 6, lines 42-46.)

Attached hereto as Exhibit C are pages 674-675 from the textbook Introduction to Ceramics by W.D. Kingery et al. This textbook indicates that in a sample of polycrystalline alumina containing 0.3% porosity and an equivalent thickness of 0.5 mm, the transmission of light is still only about 10% that of a completely dense sample. (See Fig. 13.18 and the corresponding discussion.)

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Compared to the textbook example, the Oden et al. sample is even thicker (at least 1 mm) and more porous (0.5%). The Oden et al. sample would be expected to have even less ability to transmit light than the textbook example. Applicants' claimed contrast ratio value is a measure of the mill blank's light transmissive properties; i.e., the ability of the material to allow light to pass through. (See page 4, lines 12-16.)

Moreover, the Oden et al. core was sintered in air -- sintering in air leads to more porous materials. Attached hereto as Exhibit D are pages 458-459 from Introduction to the Principles of Ceramic Processing by J.S. Reed. This textbook states that gas trapped in closed pores will limit pore shrinkage unless the gas is soluble in the grain boundary and can diffuse from the pore. Alumina doped with MgO (as used by Oden et al.) can be sintered to essentially zero porosity in an atmosphere of H₂ or O₂, which are soluble, but not in air, which contains insoluble nitrogen.

Consequently, the sintered core in the Oden et al. sample would not be expected to have the light transmissivity (contrast ratio value) required by Applicants' claims.

Independent claim 20 and its dependent claims are patentable.

**D. INDEPENDENT CLAIM 53 AND ITS DEPENDENT CLAIMS;
INDEPENDENT CLAIM 54**

Claim 53 is directed to a dental prosthesis comprising:

- (a) a crystalline ceramic substructure having a Contrast Ratio value of less than about 0.7; and
- (b) an aesthetic composite or porcelain layer on the substructure.

New claim 53 combines the subject matter of previous claims 40 and 51 as well as further indicating that the aesthetic layer on the crystalline ceramic substructure may be porcelain.

The Examiner did not reject claims 40 and 51 as being anticipated by the materials disclosed in Applicants' specification, or the Coble and Rhodes et al. patents. Accordingly, these references are not relevant to claim 53 and its dependent claims, and further discussion of the same in this regard is unnecessary.

The Examiner was of the opinion, however, that claims 40 and 51 were anticipated by Oden et al. and Jones et al. The relevance of Oden et al. has been discussed in the preceding

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section and those remarks are equally applicable to claim 53 and its dependent claims. Consequently, Applicants believe that claim 53 and its dependent claims are patentable over Oden et al.

Jones et al. disclose orthodontic brackets comprising a base member for attaching to a tooth and a body member extending from the base member. Walls on the body member define an archwire groove and are comprised of a crystalline alumina material, the strength and transparency of which provide orthodontic brackets that are more aesthetic than metal brackets and which alleviate the strength limitations of plastic and ceramic brackets. (Column 2, lines 11-22.)

Jones et al. describe techniques for applying a layer of material to the orthodontic bracket to enhance the bracket's ability to bond to a tooth surface. (See column 8.) The subsequently applied layer of material is hidden from view during use and does not constitute an aesthetic layer, much less an aesthetic layer for a dental prosthesis.

Independent claim 53 and its dependent claims are patentable. Independent claim 54 is also patentable for the same reasons.

E. REJECTIONS UNDER 35 U.S.C. §112, FIRST PARAGRAPH

The Examiner rejected claims 12, 13, 24 and 25 under the first paragraph of §112 because, in the Examiner's view, the specification does not reasonably provide enablement for blank materials having flexural strengths greater than 350 mPa. The Examiner referred to Table 2 in the application as disclosing materials having a maximum flexural strength of 342 mPa.

Support for the claimed flexural strengths may be found in originally filed application at page 5, lines 15-24. Moreover, Table 2 would be readily appreciated as providing flexural strength data for three representative materials useful in the practice of the invention (Examples 15, 18 and 19), rather than an exhaustive list of all useful materials.

F. RESPONSE TO REQUEST FOR INFORMATION

In the Office action, the Examiner requested additional information regarding the materials used to prepare Applicants' examples.

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According to Table A (p. 13), the materials described below were used to prepare the examples. These materials were commercially available when the instant application was filed and were obtained through regular channels of trade.

Material	Abbreviation Used in the Instant Application	Exhibit
Ivoclar PRoCAD	IPCAD	--
Vita Mark II Vitablock	VMV	--
Ceradyne Transtar TPA	CTTPA	E
GE Lucalox	GEL	F
Vesuvius McDaniel alumina	VMT9A	--
ZrO ₂ Single Crystal	ZrO ₂	G
Al ₂ O ₃ Single Crystal	AlX	G
Norton Prozyr ZrO ₂	NORTON	--

Manufacturer information regarding each of these materials except IPCAD, VMV, VMT9A and NORTON is attached as Exhibits E-G according to the schedule shown above. According to Table 1 and Table 2 (page 15), IPCAD, VMV, VMT9A and NORTON are comparative materials.

G. CONCLUSIONS

Applicants respectfully submit that all claims are in condition for allowance and early and favorable reconsideration of the same is requested. To the extent that the Examiner has any continuing concerns regarding the application, he is encouraged to directly contact Applicants' undersigned representative by telephone to discuss the same.

Respectfully submitted,

December 7, 2001
Date

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